

Hybrid Power System for San Juanico, Mexico

by Jerry Bianchi 12/99

Background

San Juanico, a small fishing village with an estimated population of 400 residents, is located on the Pacific coast of Baja California Sur. The Pueblo originally had an outdated and oversized 200 kilowatt (kW) generator tied to a minigrid. The system operated intermittently from 6 to 9 p.m., with only a portion of the residences on grid. Many of the homes have propane gas for cooking and about one-half have small photovoltaic (PV) panels and marine batteries to provide power for their radios and a few small lights.

The village has a very good solar and wind resources. The high-wind season starts in late September and continues through May.

The Comisión Federal de Electricidad (CFE), Arizona Public Service (APS), and Mohawk Power, under a U.S. Agency for International Development program, installed a new hybrid power system in the village to replace the aging diesel generator and minigrid. The design includes a new 85-kW standby generator, 10 Bergey Windpower Company, Inc., 7kW wind turbines, and 5 ASE Americas, Inc., 300 W-DC/50 volt PV modules rated at 3.4 kW. Energy storage is comprised of five parallel banks of Trojan L16 batteries configured for a nominal 240 volts. The system, which is controlled with a 90 kW Trace inverter, is designed to supply about 65% of the power to the village from renewables, with the genset supplying the remainder of the power (mostly during the non-windy season).

Scope

Working closely with APS, CFE, and Sandia National Laboratories, the National Renewable Energy Laboratory (NREL) has done extensive economic- and performance-modeling, including tariff structure and ability-to-pay analysis, loads analysis, and preliminary design studies based on CFE and APS cost requirements. NREL has also made several

visits to the village for site planning meetings and has established a dialogue with the local villagers for a social assessment.

NREL installed a data acquisition system (DAS) to record meteorologic data, monitor system operation, and collect data on the individual AC and DC components of the system. The data logger consists of a Campbell 23X Data Logger, AM416 multiplexer, Com200 modem, and Com100 cell phone. Data is taken at two-second intervals and stored as hourly averages. Data retrieved via cell phone is uploaded to a Microsoft® Excel file. The data is processed at the National Wind Technology Center (NWTC) and delivered to APS and CFE for review.

Status

Currently, the DAS is functioning well, considering the environment. The biggest problem to date has been ease of access to the data logger via the cellular telephone, as the conditions for cellular telephone data transmission are often poor, especially during the daytime hours. The closest repeater for the cell phone is approximately 80 miles away and is affected by the weather. Communications are best during the night. Data is usually retrieved weekly when the weather conditions permit. On one occasion during June–July, we had approximately 32 days without data retrieval. Fortunately we have not lost any data to date, because the system is capable of storing 35 or more days of data.

Planned Activities

NREL will continue to provide technical assistance to APS and CFE, as well as monitor the performance of the system and analyze the data. Future plans include a return to San Juanico to verify instrument calibration and update the data-logger program to enhance data collection. Small wind hybrid systems and data acquisition systems will continue to be tested. Finally, the prototype peak

power tracker under development by Ascension Technology will be tested at the NWTC.

NREL Contacts

Web site: <http://www.rsvp.nrel.gov>

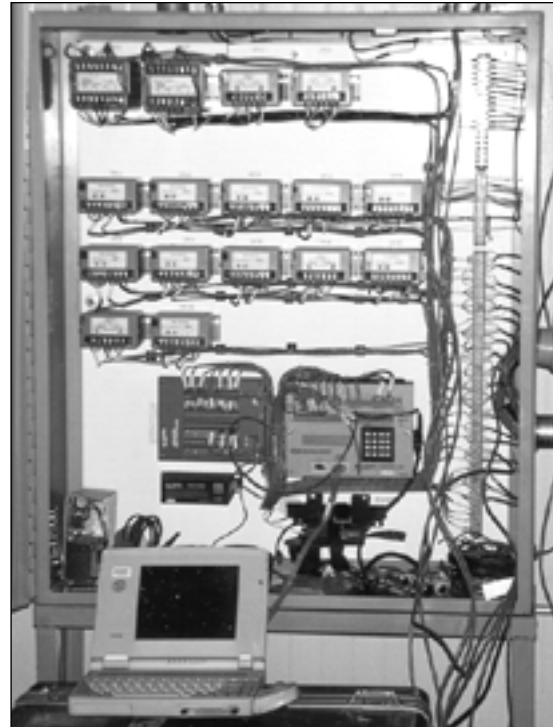
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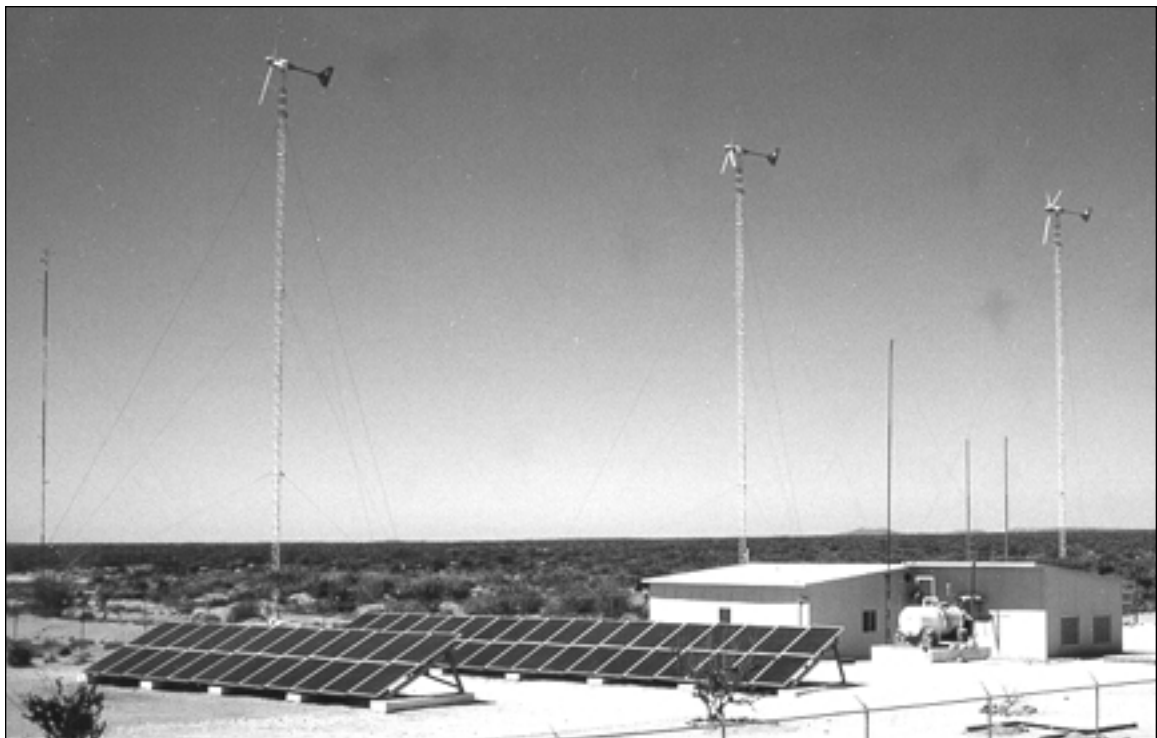
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NREL data acquisition system.



San Juanico power plant.